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KINESIO TAPING FOR SHOULDER IMPINGEMENT: A
PRACTICAL LESSON FOR PHYSIOTHERAPY STUDENTS

Degree Programme in Physiotherapy
2015

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Degree Programme in Physiotherapy

October 2015

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Number of pages: 29

Appendices: 14

Keywords: kinesio taping, shoulder impingement

The purpose of this thesis was to implement a practical lesson of kinesio taping for shoulder impingement for physiotherapy students in Satakunta University of Applied Sciences. The aim was to provide the attendants of the lesson a preparedness to use kinesio taping as a part of a physiotherapeutic treatment for shoulder impingement.

The purpose was to gather information about kinesio taping, shoulder structure and shoulder impingement. After teaching the basic information about the three subjects, the purpose was to teach the use of the method in practice.

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1 INTRODUCTION

Kinesio taping has become a widely used part of physiotherapeutic treatment as it has grown its popularity in the western world health care. Thus, coverage of kinesio taping in Degree Programme in Physiotherapy in Satakunta University of Applied Sciences is rather narrow.

Shoulder impingement is the most common tendinopathic injury of the shoulder joint (Website of Finnish Current Care Guidelines). In general, the Mini-Finland Health Survey from 2000 presents that 20.1 % of the subjects had reported shoulder pain during the past month (Viikari-Juntura, Nykyri & Takala 2000, 23).

2 PURPOSE OF THE THESIS

The purpose of the thesis is to provide a lesson of kinesio taping for shoulder impingement for physiotherapy students in Satakunta University of Applied Sciences. The aim of the lesson is to provide an adequate amount of theoretical and practical knowledge for application of kinesio taping for shoulder impingement. A physiotherapist must know the effects and techniques of kinesio taping, to be aware of the contraindications, and to identify and recognize a shoulder impingement by own assessment before applying kinesio tape for shoulder impingement.

The purpose of the lesson is to provide a preparedness and a possibility to use kinesio taping as a tool in physiotherapeutic treatment of shoulder impingement for the physiotherapy students; The structure of the lesson contains the required basic theoretical information, in addition to practical work after the theoretical part, based on the searched data and material of the thesis.

3 KINESIO TAPING

3.1 The history of kinesio taping

In Japan at the 1970s, a chiropractor Kenzo Kase noticed light skin movement to have a positive impact on joint range of motion and pain management. Kase had a goal to enable this type of fascilitation also outside physiotherapy sessions. This is how Kase came up with an elastic tape, that with specific application techniques, would enhance body's own healing process. (Website of KinesioTEIPPAUS.)

Kinesio tape is a product of cotton surface and acrylic adhesive covered by a removable paper backing. The is able to longitudinally stretch up from 130 to 140 percent of its resting length. This ability is designed for mimicking the qualities of human skin. Having the thickness of the epidermis layer of the human skin, the tape should not be consciously noticed by the patient after ten minutes from application. (Kase, Wallis & Kase 2003, 12; Website of KinesioTEIPPAUS.)

The idea behind kinesio taping is to, unlike with the traditional sports tape, is to provide the human body healing without limiting the range of motion in the joints. This, in addition to its skin-friendly materials, is why kinesio tape can be worn on skin for 3-5 days when applied in a proper way. (Kase 2003, 7.)

Today, the original brand of Kinesio Tape has dozens, if not hundreds of different manufacturers. They follow the characteristic features and abilities behind the original kinesio tape, despite their variation between price and quality. (Website of KinesioTEIPPAUS.)

3.2 The effects of kinesio taping

Kinesio taping is stated to have four different major functions; muscle support, removal of congestion to the flow of body fluids, pain reduction, and joint correction (Kase 2003b, 8).

A muscle may be dysfunctional due to an injury, abnormality in either voluntary or involuntary muscle tension, or muscle shortening (Kumbrink 2014, 7). Depending on the applied technique, the muscle support function may improve muscle activity through an improved muscle contraction or by increasing the range of motion of the joint. Vice versa, kinesio taping can also relieve pain, reduce muscle fatigue, limit overuse and cramping of muscle. (Kase 2003, 8.) The improvement of muscle function with kinesio taping is based on affecting the proprioception, the sensory system of the skin. This would result as an improved awareness of a correct muscle use. (Kumbrink 2014, 7.)

A traumatized muscle tissue may be followed by an inflammation. An inflamed muscle tissue will swell, leading to compression between the muscle tissue and skin. The skin-lifting effect of kinesio taping is used for decompressing the swollen area for gaining the effect of improvement in the lymph flow, resulting as a reduced inflammation. (Kase 2003, 8; Kumbrink 2014, 7.)

Pain reduction by kinesio taping is based on affecting the nociceptors, the free nerve endings. The nociceptors react to stimuli, resulting as a pain sensation. Kinesio tape having been applied has a stimulating effect on body's mechanoreceptors that inhibit nociception. (Kumbrink 2014, 8.) In addition, the stated effects of kinesio taping on muscle tonus and inflammation are described to have a pain decreasing influence (Kase 2003, 9).

The joint correction effect of kinesio taping produced by affecting the tonus of the muscle(s) involved in the joint, improvement of its range of motion or by causing direct mechanical support for the joint (Kase 2003, 8; Kumbrink 2014, 9).

3.3 Application of kinesio tape

As the quote by Dr. Kase presented in the introduction chapter presents, successful kinesio taping requires a certain level of understanding of both the patient's condition and applying kinesio tape in a proper way (Kase, Wallis & Kase 2003, 12). Since the tape is supposed to have a positive impact on feeling pain in addition to having nu-

merous different application variations, a wrong selection of taping may have a negative effect for the healing process (Jacobs 2003, 273).

The patient's skin should be prepared for the application of kinesio tape. This contains the skin to be free from oils and lotions. If the degree of the patient's hair growth in the area to be taped will be estimated to limit adhesion, shaving should be considered. In general, anything that limits the contact between the skin and the adhesive is a diminishing factor in both the effectiveness and duration of the applied taping. (Kase 2003, 12.)

Before applied to the skin, the tape ends should be rounded for increased duration of the application. In addition, the correct length of the tape strips should be measured before cutting the tape, including the anchor ends that are always applied with zero stretch. At this point, the taped muscle or area should be in the same position as in the actual taping situation. (Kase, Wallis & Kase 2003, 13-14; Kumbrink 2014, 9.)

According to Kase, Wallis & Kase (2003,13), and Jacobs (2003, 274) kinesio tape can be applied to the skin in a form of "Y", "I", "X", "Fan", "Web", or "Donut". The shape of a tape is determined by the size of the muscle involved and the chosen treatment method.

The "Y" shape (picture 1) is chosen for either activation or passivation of a chosen muscle. It is used for surrounding a large or several muscles with the the tails of the letter "Y", whereas the base part of it is used as a non-stretch anchor. The "Y" shape is used for both basic and corrective techniques. (Kase, Wallis & Kase 2003, 13.)



Picture 1. The "Y" shape.

The "I" shape (picture 2) is chosen for the treatment of an acutely injured muscle. It can be used on any skeletal muscle of the body, and it is used in both basic and corrective techniques (See chapter 5). The basic idea behind the "I" shape is similar to the "Y" shape described above. Thus, instead of surrounding the muscle, the "I" shape is applied directly on the treated muscle. (Kase, Wallis & Kase 2003, 13.)



Picture 2. The "I" shape.

The "X" shape (picture 3) is used for a muscle that changes its origin and insertion depending on the movement or a muscle that crosses two joints. Its length is similar to the length of the treated muscle in a stretched position. The "X" shape is used in both basic and corrective taping techniques. (Kase, Wallis & Kase 2003, 13)



Picture 3. The "X" shape.

The "Fan" shape (picture 4) taping is used for edema. The tails will determine the direction of the lymphatic drain and the base of the tape is placed on the area of the duct. The treated muscle is to be in a stretched position. (Jacobs 2003, 274.)



Picture 4. The "Fan" shape.

The "Web" shape (picture 5) is used in space corrective techniques. In the "Web" shape application, the middle part of the tape is longitudinally divided in 4-8 parts, leaving the anchor ends uncut. The affected joint is to be at its full range of motion. (Kase, Wallis & Kase 2003, 13.)



Picture 5. The "Web" shape.

The "Donut" shape (picture 6) is used for space correction. A "donut" shape is modified from an "I" shaped strip of a tape by cutting a hole in the centre of it. The strip is applied in a way that leaves the treated area in the hole. The "donut" shape is used for space correction. (Kase, Wallis & Kase 2003, 13.)



Picture 6. The "Donut" shape.

The amount of longitudinal tension applied to the tape is a critical factor in a successful tape application. Too much tension is likely to reduce the effectiveness, whereas too little tension is not considered to have as negative effect. (Kase, Wallis & Kase 2003, 14-15.)

3.4 Contraindications

In kinesio taping, known contraindications are skin conditions like open wounds, unhealed scars, neurodermatitis and psoriasis locally. (Kumbrink 2012, 11). Even though there is a taping technique for scar correction, an application of kinesio tape too early in the healing process might cause extra stress for the collagen fiber formation in the healing scar tissue (Kase, Wallis & Kase 2003, 41).

It is also stated that kinesio tape should not be applied to the genital zone when during the third trimester of pregnancy. In addition, known allergy to tape or adhesives should be taken in consideration. (Kumbrink 2012, 11.)

4 KINESIO TAPING TECHNIQUES

4.1 Muscle technique

The basic application is used for the muscle(s) involved in the treated condition. The basic application is utilized for either activation or passivation of the chosen muscles. In this technique, the "Y", "I", and "X" shapes are available, as they are described above in chapter 3.

When using the basic application, the taping direction is to be chosen according to the desired effect of the tape. To passivate the muscle, such as in cases of the muscle being overused, the taping direction should be from insertion to origin for reaching a reduced muscle activation. Vice versa, when increase in muscle activation is the goal,

the chosen direction should be origin-insertion. Regardless the chosen direction of taping, the non-stretch anchors should reach a length of 5 centimeters beyond both origin and insertion ends of the muscle. (Kase, Wallis & Kase 2003, 13-14.)

In the basic technique, both muscle tissue and tape stretching are necessary. The muscle tissue is to be put in as stretched position as possible, whereas the amount of tape stretching depends on the taping direction, and is extremely important for reaching a successful result in taping. (Kase, Wallis & Kase 2003, 14; Kumbrink 2012, 14.)

According to Kase, when taped from insertion to origin to passivate muscle function, the tape stretch should be 15-25 percent of the tape's maximal stretching length. When the aim is muscle activation and the direction is origin-insertion, 25-50 percent stretching should be applied. Kumbrink presents that regardless the taping direction, the pre-stretch of 10 percent is enough for a desired result. (Kase, Wallis & Kase 2003, 14; Kumbrink 2012, 14.)

4.2 Fascia correction technique

The fascia correction technique is used when the aim is to guide the fascia toward a certain position. The fascia is a connective tissue, connecting the skin and the structures underneath it. (Dimon 2008, 15.)

In the fascia correction technique, the "Y" strip is used for holding or guiding the fascia in a desired position with the movement of the surrounded muscle tissue. This is stated to result as pain reduction through loosening of the adhered fascia tissue. (Kumbrink 2012, 27.)

4.3 Ligament/ tendon correction technique

The ligament/tendon correction technique may be applied in the case of an injured or overloaded ligament or tendon (Kumbrink 2012, 16). A ligament attaches two bony

structures together whereas a tendon serves the same function between a muscle and a bone (Website of Duodecim).

The ligament/tendon corrective technique is described to stimulate the mechanoreceptors surrounding the ligament or tendon to be taped, and via that, to improve the body's own proprioception in the area. This will result as an improved joint function. (Kumbrink 2012, 16.)

Kase, Wallis & Kase (2003, 33) presents that there are moderate differences in the tape stretching intensity, regarding which of the two structures to be taped is in question; When taping a ligament, the stretch percentage should be 25-75, but even full stretch can be considered. When taping a tendon, the stretch percentage is 50 from the maximum available tension.

In this corrective taping technique, the taping direction (from origin to insertion or vice versa) is optional, but if restriction in joint range of motion is desired, the insertion-origin variation is recommended. A third choice is to apply stretch in the both dimension at the middle part of the tape. Regardless the chosen taping direction, the anchor ends must be applied without stretch. (Kase, Wallis & Kase 2003, 33.)

4.4 Lymphatic technique

The lymphatic taping technique is used in edema removal by utilizing the skin-lifting abilities of kinesio tape (Kase, Wallis & Kase 2003, 39). The skin being lifted with the aid of kinesio tape, it is stated to reduce pressure subepidermally in the treated area, resulting as an improved congestion of both blood and lymphatic flow. In a successfully applied lymphatic taping, this would result as a reduced local edema and inflammation due to removal of excess heat and chemical substances, and through that, followed by a reduced pain sensation. (Kase 2003, 9; Kase, Wallis & Kase 2003, 39; Kumbrink 2012, 28-29.)

5 SHOULDER IMPINGEMENT

5.1 Shoulder structure

The shoulder joint alias glenohumeral joint (picture 7) connects the humerus and the glenoid cavity of the scapula. It is a synovial ball-and-socket-joint, which makes it highly movable. It has a wide variety of movements, and actually it is the most movable joint of the human body. (Snell 2007, 394, 396.) Basically, it has all the classified directions of joint movement; flexion, extension, hyperextension, abduction, adduction, medial and lateral rotation, and the combination of them, circumduction (Tortora & Derrickson 2009, 285).

As mentioned above, the glenohumeral joint belongs to a joint type of a synovial ball-and-socket-joints. This means the head of the humerus is the "ball", making the glenoid cavity the "socket" in the couple. (Hartwig 2008, 293.) These two structures articulate in a relatively small area of surface because of the shallowness of the glenoid cavity, enhanced by labrum, its fibrocartilaginous surrounding, in relation to the form and size of the head of the humerus. This results as such a wide variety and amount of mobility for the humerus and through that, to the whole upper extremity. (Anderson 2003, 132; Drake, Vogl & Mitchell 2012, 347.)

The glenohumeral joint is surrounded by the articular capsule that unites the bones. The articular capsule includes two layers, outer fibrous membrane and inner synovial membrane. The former contains a band- like matter called connective tissue, that stabilizes the joint. The latter, synovial membrane, secretes synovial fluid for joint lubrication, reduced friction and shock absorption.(Drake, Vogl & Mitchell 2012, 11; Tortora & Derrickson 2009, 267.)

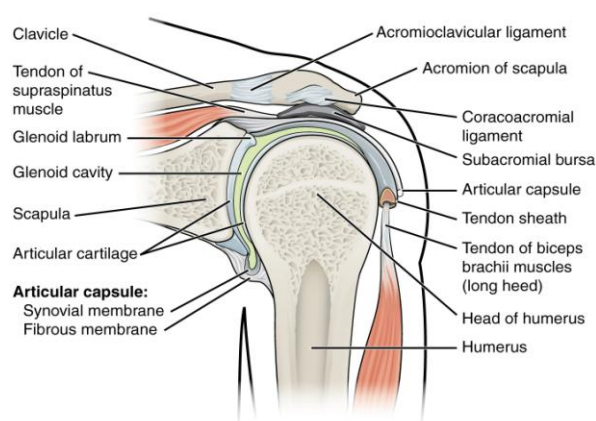
The bony surfaces forming the glenohumeral joint are covered by a matter called articular cartilage. Articular cartilage prevents the head of the humerus and the glenoid cavity being in a direct contact, therefore it reduces friction of the bones during joint movement. In addition, the articular cartilage takes part in shock absorption of the joint. Even the articular cartilages in the glenohumeral joint are not in direct contact,

but are instead separated by a space called synovial cavity. This space on its behalf contains the synovial fluid secreted by synovial membrane, for a minimized friction. (Amitrano & Tortora 2012, 128.)

There are four sac-like bursae associated with the glenohumeral joint. The bursae are filled with a matter similar to synovial fluid, therefore they have a functional similarity in the joint with the joint capsule. The four bursae of the glenohumeral joint are subscapular bursa, subdeltoid bursa, subacromial bursa, and subcoracoid bursa. (Tortora & Derrickson 2009, 270, 284.)

The glenohumeral joint is stabilized by coracohumeral, transverse humeral and three different glenohumeral ligaments (Tortora & Derrickson 2009, 284). The function of a ligament is to bind two bones together and to provide stability for the joint (Website of U.S. National Library of Medicine.)

The coracohumeral ligament situates between the superior part of the articular capsule in the glenohumeral joint and the greater tubercle of humerus. The three glenohumeral ligaments bind the glenoid cavity and humerus together at the anterior aspect of the joint. The glenohumeral ligaments produce only minimal strength, but stabilize the joint when the end ranges of motion of the humerus. The transverse humeral ligament, between the greater and lesser tubercles of humerus, binds the long head of the biceps brachii. (Tortora & Derrickson 2009, 284.)



Picture 7. Shoulder structure. (The website of Openstax)

5.2 Shoulder stability

Being rich in mobility and being provided relatively bit of stability by its ligaments, the glenohumeral joint stabilization is performed mostly by musculotendinous structures. This group of muscles that play a vital part in shoulder stabilization is called by the term rotator cuff; supraspinatus, infraspinatus, subscapularis and teres minor. (Reese & Bandy 2013,47.) It is characteristic for all the rotator cuff muscles to originate from scapula and attaching to the humerus and the glenohumeral joint capsule by their tendons, binding the two skeletal structures together (Tortora & Derrickson 2009, 373).

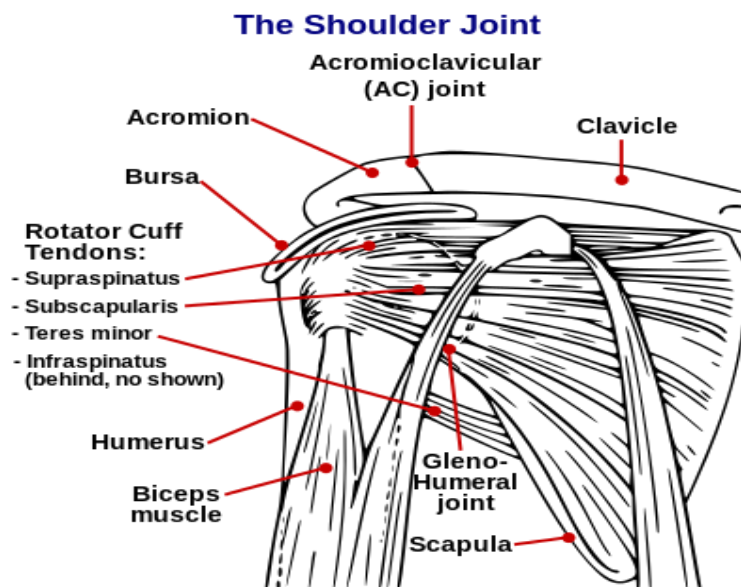
The rotator cuff muscles provide stability to the glenohumeral joint by pressing the head of the humerus against the glenoid cavity during humerus movement and by providing counterforce against the other muscles moving the humerus in purpose of preventing overwhelming shoulder movement (Carr & Harvie 2005,101).

The supraspinatus muscle (picture 8) originates from the supraspinous fossa of scapula and inserts to the lesser head of the humerus (Tortora & Derrickson 2009, 373). Its function besides stabilizing the glenohumeral joint is to abduct the humerus for the first 15-30 degrees, so that the deltoid muscle can activate and continue the movement (Hartwig 2008, 359).

The infraspinatus muscle (picture 8) originates from the infraspinous fossa of scapula and inserts to the greater head of humerus. Infraspinatus laterally rotates humerus. (Tortora & Derrickson 2009,373.)

The subscapularis muscle (picture 8) originates from the subscapular fossa of the scapula, and inserts to the lesser head of humerus. Subscapularis medially rotates humerus. (Tortora & Derrickson 2009, 373)

The teres minor muscle (picture 8) originates from the inferior lateral border of scapula, inserting to the greater head of humerus. Teres minor laterally rotates and extends humerus.(Tortora & Derrickson 2009, 373.)



Picture 8. The rotator cuff. (Website of National Institute of Arthritis and Musculoskeletal and skin diseases)

5.3 The cause of shoulder impingement

Shoulder impingement occurs in the area where the tendons of the rotator cuff muscles insert to the humerus. This attachment area is described by a term subacromial space, formed by acromion and the head of humerus. (Hyvönen 2003, 22.) In an impinged shoulder, the rotator cuff tendons or subacromial bursa get compressed, either caused by genetic factors or swelling due to inflammation by overuse or trauma, and as a result it gets impinged between the acromion and humerus (Pohjolainen 2012).

The subacromial impingement can be divided in intrinsic and extrinsic factors. The intrinsic and extrinsic factors can be categorized again in primary and secondary causes of impingement. (Hyvönen 2003, 24.) The intrinsic impingement is caused due to overuse of the glenohumeral joint and repetitive overhead activity. The extrinsic factors include impingement due to the shape of acromion, disturbance in muscle control or degeneration of acromioclavicular joint. (Paavola 2009, 23.)

The primary subacromial impingement, regardless being intrinsic or extrinsic, is caused by a decrease in size of the subacromial space related to the inserting rotator cuff tendon. This results as a compression of the rotator cuff tendons. The cause behind the primary subacromial impingement is described to originate from a degeneration or inflammation of bones, ligaments or soft tissue. (Ellenbecker 2006, 4; Hyvönen 2003, 24; Website of Duodecim.)

The secondary impingement is described to be caused by external factors, like muscle dysfunction, joint instability, neurological trauma, or tightness of the posterior capsule. As described above in this chapter, the rotator cuff muscles play a vital part in glenohumeral joint stabilization. A dysfunction in a single or several muscle(s) belonging to this group may cause as an unsuccessful stabilization of the head of the humerus, allowing its movement anterosuperiorly, making it compress the subacromial space. Alternatively, an excessive stress of the rotator cuff muscles might cause an inflammation on their tendons or bursa, again resulting as swelling and via that, an impinged state. (Hyvönen 2003, 26; Paavola 2009, 23; Vuorenmaa, et al. 2011.) This relatively minor tendon injury may cause an excessive disturbance in glenohumeral joint stabilization, resulting as more severe rotator cuff injuries, for instance tendinous ruptures (Ellenbecker 2006, 5).

5.4 The symptoms of shoulder impingement

The symptoms of shoulder impingement start gradually (Paavola 2009, 23-24). The most common symptom is diffuse pain laterally and proximally from elbow during humerus movement, especially during abduction. In addition, nighttime pain and pain during overhead activity both instantly and delayed are listed as impingement symptoms. (Paavola 2009, 24, Pohjolainen 2012.)

In addition, a typical pain symptom for subacromial impingement is present during painful arc. The painful arc occurs in glenohumeral abduction, from 60 degrees up until 120 degrees. Before and beyond this phase the movement might be pain free. (Pohjolainen 2012.) This is due to the subacromial space being on its narrowest between the 60 and 120 degrees of abduction (Magee 2014, 272). The painful arc is

often connected to a disturbance in muscle control in a movement pattern called scapulohumeral rhythm, in which scapula and shoulder move in a ratio of 1:2. In occurrence of a disturbance of scapulohumeral rhythm, activation of the muscles moving and stabilizing scapula are beneficial regarding the success in rehabilitation of shoulder impingement. (Clarkson 1999, 159.) Wilk, Reinold & Andrews (2009, 33.) present that particularly the trapezius and serratus anterior muscles play a vital role in scapular control during glenohumeral joint movement. The previous originates from inserting to, whereas the latter originates from insertion.

5.5 Examination of shoulder impingement

In clinical examination, soreness when palpated is often present laterally from acromion. In addition, painful arc is typically found in the examination. (Paavola 2009, 24). It is stated that a combination of tests gives more reliable results compared with performing only one (Magee 2014, 315). In addition to the painful arc test, two other subacromial impingement tests are listed as the most useful and used in shoulder examination: The Hawkins-Kennedy test and The Neer Impingement Sign. (Warth & Millett 2015, 86.)

The Hawkins-Kennedy Test, introduced by Hawkins and Kennedy in 1980, is applied by medially rotating the patient's shoulder after placing both shoulder and elbow in flexion of 90 degrees. A positive sign of Hawkins-Kennedy test is pain, typically at the anterior aspect of shoulder, due to an increased pressure of the supraspinatus tendon. (Codsì, McCarron & Brems 2009, 163; Magee 2014, 315; Warth & Millett 2015, 88.)

The Neer Impingement Sign, originally described in 1983, is based on provoking pain by reducing the space between the head of humerus and acromion. In the Neer Impingement Sign, The other hand of the examiner lifts the patient's arm in full elevation meanwhile the other hand stabilizes the patient's clavicle and scapula. The scapular stabilization prevents upward rotation of the scapula, resulting as an increased compression in the subacromial space. The decreased space causes an impingement sign in the supraspinatus tendon, subacromial bursa and/or

coracoacromial ligament. (Codsì, McCarron & Brems 2009, 163; Magee 2014, 100; Warth 2015, 87.)

5.6 Treatment of shoulder impingement

According to Finnish Current Care Guidelines, physiotherapy for shoulder impingement includes reducing inflammation and pain, improving shoulder and scapular strength focusing on scapular control (Website of Finnish Current Care Guidelines) At the acute stage of shoulder impingement, the movements that cause pain sensation should be reduced or even totally discontinued. Avoidance of arm elevation and abduction is recommended. Additionally, in the acute phase of shoulder impingement, cold treatment may be applied for reduction of pain, swelling and inflammation. (Pohjolainen 2012.)

In addition to taping, the physiotherapy for shoulder impingement may include education, modalities, exercise and manual therapy. The education includes teaching a proper posture; it has been stated that a proper posture of the thoracic spine results as a decreased muscle activity in upper and middle trapezius, infraspinatus, serratus anterior and anterior and middle fibers of the deltoid. In addition, the rhythm of the movement of trunk and shoulder improved. (Huijbregts & Bron 2016, 315-316.)

The resisted exercise therapy may be started with scapular retraction exercises. This is applied by actively retracting the scapula while abducting the arms. When applied successfully, this improves the humeroscapular rhythm. Once the patient is able to elevate the humerus up to 90 degrees with scapulas retracted, the resisted exercises involving glenohumeral movement may be started. This includes strengthening the external rotators of the glenohumeral joint and strengthening the supraspinatus. (Griffin 2015, 356-357.)

6 KINESIO TAPING FOR SHOULDER IMPINGEMENT

The treatment of an early stage subacromial impingement consists of rest, cold treatment and pain medication, possibly including a subacromial corticosteroid injection (Paavola 2009, 24). In addition, according to Ellenbecker (2006, 6) improvement of scapula stabilization and increase in blood flow in the area should be applied already at an early stage of shoulder impingement.

Overuse of the muscle(s) being impinged is a common cause of subacromial impingement (Hyvönen 25-26). Pohjolainen (2012) presents that controlling the tonus of these muscles plays a role in the rehabilitation process. Both Kumbrink (2012, 134-135) and Kase, Wallis & Kase (2003, 54-55) present tonus reduction for the musculotendinous structure(s) being impinged, in their examples supraspinatus and deltoid, as the primary application. In practice this means muscle taping from insertion to origin for the selected muscles. In addition to the tonus inhibiting muscle taping, both Kumbrink and Kase present fascia taping as a part of kinesio taping for shoulder impingement.

Thelen, Dauber & Stoneman (2008, 389) made a research on the tonus reducing muscle taping technique on supraspinatus and deltoid alongside fascia taping for patients diagnosed with shoulder impingement with a randomized, double-blinded, clinical trial. The trial resulted as an immediate improvement in active shoulder abduction. Other movement directions showed no difference compared with the sham taping technique group, neither was there difference in pain sensation or range of motion after the immediate effect.

Kaya, Zinnuroglu & Tuqcu (2011) published a research about a comparison between kinesio taping and physical therapy modalities in treating shoulder impingement. The kinesio taping treatment included tonus inhibiting muscle taping on the supraspinatus, deltoid and teres minor muscles. Additionally, fascia and lymphatic taping techniques were applied. The physical therapy group received ultrasound, TENS, exercise and hot bag treatment. The kinesio taping group experienced significantly lower pain during rest, movement and sleep during the first week. During the second week, there was no mentionable differences between the two exam groups.

Shaheen, Bull & Alexander (2014) researched, using the similar principles in the tape application as in the ones mentioned above, that kinesio taping had an improvement in scapular control and pain sensation in shoulder movement on sagittal plane for participants diagnosed with shoulder impingement.

Furthermore, a study has been published about trying to improve scapular stabilization or kinematics with kinesio taping for participants with shoulder impingement. The ideology behind the study was to improve humeroscapular rhythm and through that, to have an impact on shoulder impingement.

Hsu, Chen, Lin, Wang & Shih (2009) presented a study about muscle tonus increasing muscle taping on lower trapezius for baseball players with shoulder impingement. The tape application was reported having improved lower trapezius activation and strength, in addition with an improved scapular control. This study concluded that improving lower trapezius activation and scapular control can be a beneficial tool in rehabilitation of shoulder impingement.

7 THESIS PROCESS

7.1 The idea of the thesis

The idea of the thesis was born in 2013 when the author was struggling with his shoulder impingement recovery. Being nearly desperate to try any conservative treatment, kinesio taping seemed worthwhile. While it did not make wonders, the author experienced it to temporarily decrease pain sensation. This gave the author an idea and motivation to improve his kinesio taping skills. In addition, since the learning of kinesio taping in the curriculum is minimal, the author wanted to give other physiotherapy students a possibility to improve theirs.

As mentioned above, the amount and quality of research of effectiveness of kinesio taping in rehabilitation of musculoskeletal disorders is not adequate. Being a relative-

ly new method in the western world physiotherapy might play a part in it. Nevertheless, according to the author's own experience from clinical placements and self-evaluation of his own shoulder impingement recovery, it may have positive impact on the clients' rehabilitation process. Additionally, kinesio taping is somewhat widely utilized in musculoskeletal physiotherapy in Finland, the author found the basic theoretical and practical knowledge of kinesio taping to be practical to have for future bachelors of physiotherapy.

7.2 The progress of the thesis

As mentioned above, the idea behind the thesis was born in 2013. Reaching its end in 2015, the author feels it has taken for a far more extended time as it had been ideal for a bachelor's degree thesis. Long story short, there were so many factors in the author's personal life that made working with the thesis extremely challenging. In fact, the author feels that not despite of, but because of the extended time frame the writing process felt challenging. Thus, in these circumstances, an improved planning of the process would have been beneficial.

7.3 Implementation of the lesson

The lesson about kinesio taping for shoulder impingement for students of physiotherapy in Satakunnan Ammattikorkeakoulu took place on May 19th 2015. The number of attendants was 10. The progress of the approximately 90 minutes long lesson started with theory by Microsoft Powerpoint slides (appendix 1-14) based on the information gathered for the thesis, continued with practical taping training and finished with discussion and feedback about the lesson.

As discussed above in the thesis, according to Kase, the person applying kinesio tape is supposed to be aware of the principles of kinesio taping. (Kase, wallis & Kase 2003, 12) The theory part started with information about kinesio taping: The history, effects, purpose of use and different methods were discussed. The aim of the first part was to give the attendants a possibility to learn the basic information about

kinesio taping, the indications and contraindications of its use, the most commonly used taping techniques and application of the tape. Through that, the attendants would have a preparedness to apply kinesio tape.

The other factor a succesful application of kinesio tape is depended on is a proper evaluation of the patient's condition. The lesson continued with going through the structure of the shoulder and the basics of subacromial impingement. The audience consisted of physiotherapy students on different classes and a variation of level of information. The aim of this part was to either rehearse or learn the structure of the glenohumeral joint and the causes, symptoms and examination of shoulder impingement. Through this, the attendants would have a preparedness to apply kinesio tape for shoulder impingement.

After undergoing the theory parts, it was time for the attendants to learn a few tape application examples in practice. The author selected two muscle tape applications, one inhibiting and one activating muscle tonus. The muscle tonus inhibiting tape application was selected for the supraspinatus muscle (picture 9), mainly due to a high incidence in shoulder impingement as mentioned above in the text.



Picture 9. Muscle taping for the supraspinatus muscle)

The muscle activation technique was chosen to be for the lower part of the trapezius muscle (picture 10). As presented above in the text, scapular stabilization is performed by underlining by the serratus anterior and the lower and middle fibers of the trapezius. Referring to that, the author selected the lower part of trapezius for the activating muscle taping.



Picture 10. Muscle taping for the lower part of the trapezius muscle.

After the tape application practice there was a discussion about the lesson and kinesio taping. The outcome revealed that despite a lack of high level evidence based research, physiotherapy students are willing to learn about kinesio taping and prefer to use it in their professional career. It was also discussed that learning the deeper skills of kinesio taping as a part of physiotherapeutical treatment, the learning should be more thorough and would require a longer time frame.

8 DISCUSSION

As it has been discussed above in the thesis, there is not a lot of evidence based material regarding the effectiveness of kinesio taping in treatment of shoulder impinge-

ment. Additionally, the studies that have been made around the topic do not very strongly support the use of kinesio taping for shoulder impingement. Nevertheless, the author's own clinical experience and the popularity of the method amongst in physiotherapy favour its use. The author concludes that whereas kinesio taping for shoulder impingement might or might not decrease the patients' pain sensation, improve the range of motion or result in any type of the described effects, it is not likely to worsen the situation if applied in a correct way. In addition, since the employees in the field of physiotherapy offer kinesio taping for the patients and clients, the author thinks knowing the basics can be essential when applying for an employment.

For a further study or a topic of the bachelor's thesis the author suggests data gathering from the local physiotherapists or their clients regarding their experienced effects of kinesio taping methods in the treatment of shoulder impingement: The author feels this would give precious information of the utility of kinesio taping for shoulder impingement while the amount of the evidence based study falls short.

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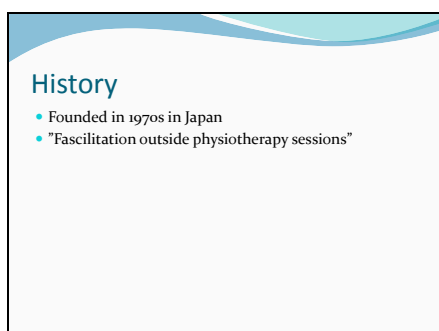
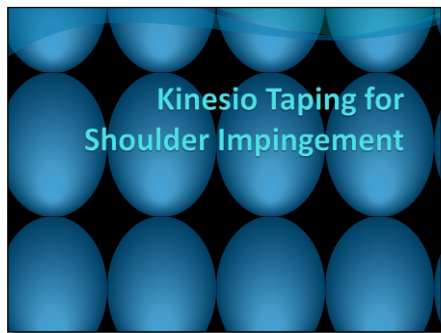
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Kinesio Tape

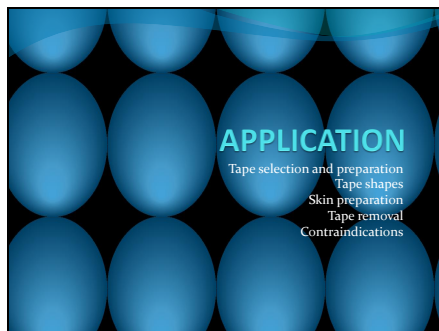
- Structure: cotton surface, acrylic adhesive, paper backing
- Stretches longitudinally up to 140%
- Pre-stretched to 10%
- Thickness and ability to stretch created for mimicking human skin
- Controversial color theories

Kinesio Tape vs. Sports Tape

Kinesio Tape	Sports Tape
<ul style="list-style-type: none">• Ability to stretch• Can be worn for several days• Swimming, sauna, shower• Does not limit joint movement	<ul style="list-style-type: none">• Does not stretch• Can not be worn overnight• Limits or blocks joint movement

The effects of Kinesio Taping

- Change in muscle tonus
- Joint support
- Improved proprioception
- Improved blood and lymphatic circulation
- Pain reduction



Tape selection and preparation

- The ends are rounded for increased duration
- The tape ends, the anchors, are always non-stretch
- The correct length of tape is measured with the area in the taping position
- More stretch does not equal a better result:
Too much tape tension may worsen the situation


Tape Shapes

- Selected according to the desired effect and size/shape of the treated area

APPENDIX 4

I


- Used for muscle & joint techniques
- Placed directly on the taped area



A diagram showing a single, thick, black horizontal bar representing an 'I-tape' applied directly to a surface.

Y


- Used for (large) muscle techniques
- Fascia technique
- Tails surround the muscle, base is the anchor



A diagram showing a 'Y-tape' application. It consists of a single black horizontal bar at the base, from which two black lines (tails) extend upwards and outwards, forming a 'Y' shape.

X


- Used in muscle taping
- Muscles that change origin and insertion during movement
- Muscles that cross two joints



A diagram showing an 'X-tape' application. It consists of two black lines crossing each other in the center, forming an 'X' shape.


Fan

- Anchor + 4 longitudinally cut tails
- Affects lymphatic circulation
- Tails on edema, anchor on area of duct




Web

- Anchors in both ends, 4 longitudinally cut tails in the middle
- Improves lymphatic circulation



Donut

- A hole cut in the middle of the tape
- The hole is placed on the treated area
- Improves lymphatic circulation



Skin Preparation

- Skin preparation:
 - Clean, dry skin
 - Hair removal?
 - Anything that limits the contact between the tape and the skin will limit the effectiveness of taping

Tape Removal

- Direction of body hair
- Moisturising the tape may help
- Push the skin away rather than pull the tape

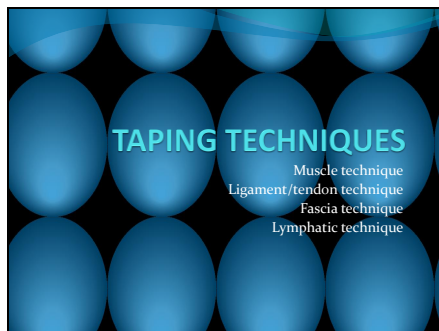
Contraindications

Circulation

- Congestive heart failure
- Deep vein thrombosis
- Kidney conditions
- Cancer
- Infection
- Genital zone in 1st trimester of pregnancy

Skin

- Wounds, unhealed scars
- Acute psoriasis
- Acrylic allergy

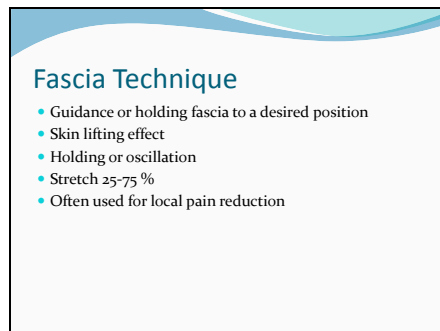


Muscle technique

- Muscle activation: origin -> insertion
- Muscle inactivation: insertion- origin
- The taped muscle stretched actively or passively
- No additional tape stretch
- Non-stretch anchors of ~5cm on both ends

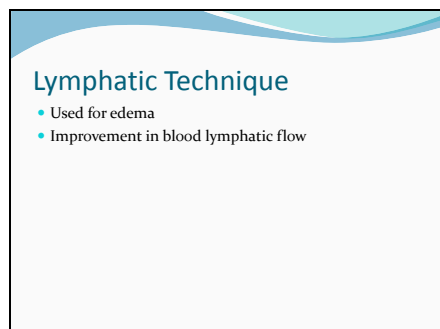
Ligament/tendon technique

- Injury or overload of ligament/tendon
- Improvement in proprioception
- Mechanical support
- O-I, I-O, or middle part stretched in both directions
- Non-stretched anchors
- Skin in stretched position
- Tape stretch 80-100 %



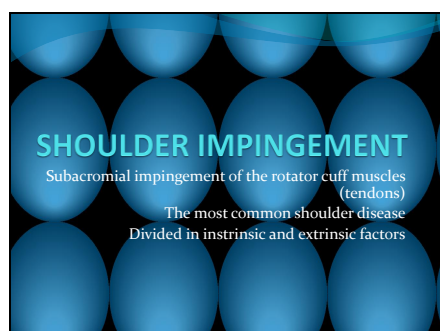
Fascia Technique

- Guidance or holding fascia to a desired position
- Skin lifting effect
- Holding or oscillation
- Stretch 25-75 %
- Often used for local pain reduction



Lymphatic Technique

- Used for edema
- Improvement in blood lymphatic flow



SHOULDER IMPINGEMENT

Subacromial impingement of the rotator cuff muscles (tendons)

The most common shoulder disease

Divided in intrinsic and extrinsic factors

Impingement Symptoms

- Radiative pain
- Nighttime pain
- Pain during overhead activities
- Painful arch: 60-120 degree abduction
- Stiffness and weakness secondary to pain

Impingement Etiology

Intrinsic Factors

- Repetitive overhead activity

Extrinsic factors

- Shape of acromion
- Shoulder instability
- Disturbed muscle recruitment (e.g. humeroscapular rhythm)

Glenohumeral Joint

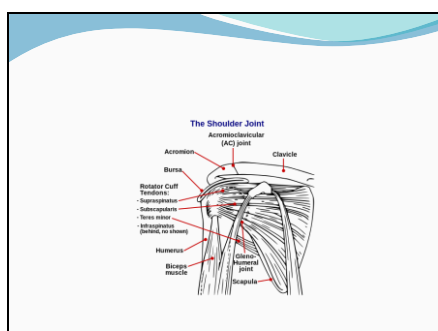
- Humerus - glenoid cavity of scapula
- Synovial-ball-and-socket joint = wide mobility
- The ligaments of the joint provide only a little stability
-> stabilization by rotator cuff

Rotator cuff

- M. Supraspinatus, Infraspinatus, Subscapularis, Teres minor
- Stabilize the glenohumeral joint by pressing the head of humerus to the glenoid cavity

Rotator Cuff

Muscle	Origin	Insertion	Function
Supraspinatus	Supraspinous fossa of scapula	Greater tubercle of humerus	humerus abduction
Infraspinatus	Infraspinous fossa of scapula	Greater tubercle of humerus	Humerus external rotation
Subscapularis	Subscapular fossa of scapula	Lesser tubercle of humerus	Internal rotation of scapula
Teres minor	Inferior lateral border of scapula	Greater tubercle of humerus	Humerus external rotation + extension



Humeroscapular Rhythm

- Coordination of scapula and humerus during abduction
 - Scapular movement enables normal shoulder function
 - 2:1 ratio of movement
 - Disturbed humeroscapular rhythm may cause shoulder conditions, e.g. impingement
- > importance of scapular control

Impingement tests

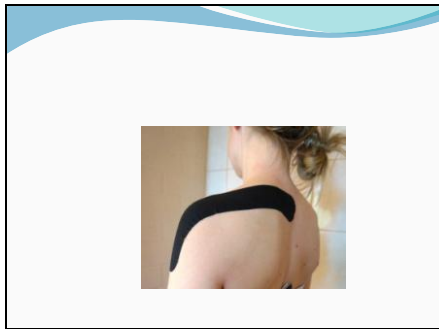

- Painful arch: 60-120 degrees in abduction
- Neer: passive humerus flexion, scapula fixated
- Hawkins-Kennedy: humerus and elbow flexion at 90 degrees -> passive internal rotation
- Infrapinatus test: resisted external rotation of the humerus

Taping Examples

Supraspinatus impingement
Dysfunction in scapular stability
Pain


Muscle taping of m. Supraspinatus (I-O)

- Insertion-Origin : Greater tubercle of humerus -> supraspinous fossa of scapula
- I or Y
- Non stretch Anchors ~5cm
- Measurement and taping in Stretched position (shoulder adduction, Lateral neck flexion)



Muscle tape lower trapezius activation (O-I)

- Activation in scapular stabilization
- T4-T12 -> spine of scapula
- I or Y
- Non- stretch anchors in both ends
- Measurement and taping in stretched position



APPEND
IX 14

